



# The effect of transesophageal probe placement on endotracheal tube cuff pressure and perioperative reintubation in congenital cardiac surgery

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## INTRODUCTION

High endotracheal tube (ETT) cuff pressure (CP) during mechanical ventilation is associated with reduced mucosal blood flow and ischemia that can result in perioperative airway complications. Studies in adults and children have shown that transesophageal echocardiography (TEE) probe placement significantly increases ETT CP.

This study aimed to determine:

- 1) if there is a significant increase in ETT CP in children after TEE insertion
- 2) whether lower tracheal perfusion pressure during surgery with CPB is associated with postoperative reintubation.

## METHODS

- Prospective observational study
- Patients undergoing cardiac surgery with cardiopulmonary bypass (CPB) and intraoperative TEE
- ETT CP measured at different time points:
  - anesthesia induction and endotracheal intubation
  - adjustment for CP <25 cm H2O prior to TEE insertion
  - TEE insertion
  - readjustment for CP <25 cm H2O (CP CPB)
  - at end of the anesthetic (CP final) prior to extubation or transfer to the cardiac intensive care unit.
- Patients were followed for postoperative reintubation.

## RESULTS

Table 1. Cuff pressure changes after transesophageal echocardiography by age group

	Initial cuff pressure	Reset cuff pressure	Pressure after TEE insertion	Change in pressure	P-value
< 1 year old (N=17)	11 (10 - 21)	22 (20 - 22)	24 (22 - 29)	2 (1 - 5)	<0.001
1-6 years old (N=11)	24 (18 - 30)	23 (20 - 26)	27 (24 - 31)	4 (2 - 7)	0.004
6-12 years old (N=9)	30 (26 - 30)	25 (24 - 26)	30 (28 - 32)	6 (3 - 8)	0.008
12-18 years old (N=6)	43 (29 - 70)	21 (20 - 22)	34 (26 - 40)	16 (6 - 18)	0.027
> 18 years old (N=7)	35 (29 - 43)	22 (20 - 26)	37 (32 - 38)	12 (8 - 15)	0.018
Total (N=50)	26 (18 - 30)	22 (20 - 25)	29 (25 - 34)	5 (2 - 12)	<0.001

Values presented as median (interquartile range) in cm H<sub>2</sub>O

Figure illustrating the percent of patients in each group with endotracheal cuff pressure >30 cm H2O (red). (A) Proportion with cuff pressure >30 cm H2O immediately after intubation. Cuff pressure was then reset within goal range of 20-25 cm H2O. (B) Proportion with cuff pressure >30 cm H2O after transesophageal echocardiography probe insertion.

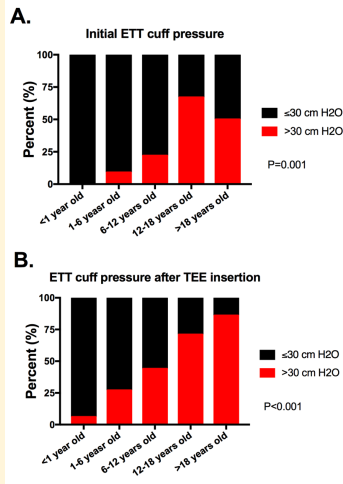


Table 2. Characteristics of infants who required post-operative reintubation vs. those who did not

	Reintubated (N=4)	Not reintubated (N=20)	P-value
Male gender, N (%)	2 (50)	13 (65)	0.615
Age (days)*	17 (8 - 88)	47 (10 - 107)	0.461
Weight (kg)*	3.2 (3 - 4.6)	4 (3.4 - 6.3)	0.152
Bypass (min)*	140 (35)	86 (34)	0.009
ECMO, N (%)	0 (0)	2 (10)	NS
Immediate extubation, N (%)	0 (0)	8 (42)	0.257
ENT consult, N (%)	2 (50)	2 (10)	0.115
Trach, N (%)	1 (25)	0 (0)	0.167
TPP pre-bypass (mm Hg)**	42 (20)	41 (11)	0.977
TPP bypass (mm Hg)**	22 (11)	23 (7)	0.79
TPP post-bypass (mm Hg)**	43 (7)	43 (9)	0.986
TPP average (mm Hg)**	36 (12)	36 (7)	0.95

\*Values presented as median (interquartile range)  
\*\*Values presented as mean (standard deviation)

- Four (7%) patients required reintubation and all 4 were infants.
- Within the infant group, no significant difference in tracheal perfusion pressure (TPP = MAP - ETT CP) during the pre-bypass, bypass, post-bypass, or average total anesthesia duration between those who required reintubation and those who did not

- Total of 59 patients (aged 4 days to 42 years old, median 3.9 years old).
- Nine (15%) patients did not have initial CP data.

## SUMMARY

- Increase in ETT CP with TEE probe placement across all age groups
  - Consistent with previous adult/pediatric studies
  - Magnitude of change in CP less in infants and young children
    - May be due to more compliant tracheas
- All reintubations involved infants
  - No correlation with ETT CP or tracheal perfusion pressure
- Checking CP with TEE probe placement in children may not be warranted as CP rarely >30 cm H2O

## Significance

- TEE probe placement results in small increases in the ETT CP in children undergoing cardiac surgery.
- Factors beyond intraoperative ETT CP likely play a role in postoperative reintubation.

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